

Firefighter Certification II (FIRS 1407)



Credit: 4 semester credit hours (3 hours lecture, 3 hours lab)

Co-requisite: FIRS 1103, FIRS 1301, FIRS 1319, FIRS 1329, and FIRS 1433

Course Description

One in a series of courses in basic preparation for a new firefighter. Should be taken in conjunction with Firefighter Certification I, IV, VI and VII to satisfy the Texas Commission on Fire Protection (TCFP) curriculum for Basic Structural Fire Suppression, Course #100. ***This course may be offered only by institutions licensed as a fire academy by the Texas Commission on Fire Protection.***

Required Textbook and Materials

1. *Essentials of Fire Fighting and Department Operations* 6th Edition. Brady Publishing. Validated by IFSTA
ISBN-13: 9780133140804
2. *Hazardous Materials for First Responders* 5th Edition. Published by: Fire Protection Publications, Oklahoma State University. Validated by IFSTA
ISBN: 9780879396138

Course Objectives

Upon completion of this course, the student will be able to:

1. Demonstrate competencies, for subjects taught, set forth in the TCFP curriculum for Basic Fire Suppression found at

http://www.tcfp.state.tx.us/standards/curriculum_manual/chapter_1.pdf

101-1.00 The firefighter trainee shall identify state laws and rules related to health and safety.

101-2.00 The firefighter trainee shall describe the responsibilities of a firefighter relating to compliance with the provisions of occupational safety and health programs.

101-3.00 The firefighter trainee shall identify the correct laws and rules applicable to Basic Firefighter certification by the Texas Commission on Fire Protection.

101-4.00 The firefighter trainee shall identify the various levels of instructor certification by the Texas Commission on Fire Protection.

102-1.00 The firefighter trainee shall identify, safely carry, and describe how to use forcible entry tools safely.

103-1.00 The firefighter trainee shall be able to describe the purpose of the NFPA standard applicable to portable fire extinguishers.

104-1.00 The firefighter trainee shall be able to describe the purpose of the NFPA standard applicable to ropes.

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- 105-1.00 The firefighter trainee shall be able to describe the purpose of the NFPA standards applicable to fire service ladders.
- 106-1.00 The firefighter trainee shall be able to describe the purpose of the NFPA standards applicable to fire service hose.
- 107-1.00 The firefighter trainee shall identify and describe the purpose of salvage and its value to the fire department and in public relations.
- 108-1.00 The firefighter trainee shall identify and describe the safety precautions necessary during overhaul.
- 109-1.00 The firefighter trainee shall identify, define, and demonstrate characteristics of fire streams.
- 110-1.00 The firefighter trainee shall identify and describe the principles, advantages, and effects of proper ventilation.
- 111-1.00 The firefighter trainee shall describe and demonstrate the proper techniques of searching for victims.
- 112-1.00 The firefighter trainee shall be able to describe the purpose of the NFPA standard applicable to fire prevention inspections.
- 113-1.00 The firefighter trainee shall describe the operation of fire hydrants, fully open and close fire hydrants, and identify the NFPA hydrant color code.
- 114-1.00 The firefighter trainee shall be able to describe the purpose of the NFPA standards applicable to fire protection systems.
- 115-1.00 The firefighter trainee shall identify and describe the process of combustion and define key terms associated with fire science.
- 116-1.00 The Firefighter trainee shall identify and be able to describe the purpose, goals, and definitions of the NFPA standards applicable to Hazardous Materials.
- 117-1.00 The firefighter trainee shall explain, identify, or demonstrate emergency service communication procedures.
- 118-1.00 The firefighter trainee shall describe the importance and purpose of communications between the fire department and the community.
- 119-1.00 The firefighter trainee shall define the following terms related to wildland fire suppression.
- 120-1.00 The firefighter trainee shall describe the purpose of the following NFPA standards applicable to SCBAs.
- 121-1.00 The firefighter trainee shall be able to describe the purpose of the following NFPA standards applicable to personal protective equipment.
- 122-1.00 The firefighter trainee shall be able to describe the purpose of the NFPA standard applicable to professional firefighters.
- 123-1.00 The firefighter trainee shall identify and describe the basic types of building construction and the general fire behavior expected with each type of construction.
- 124-1.00 The firefighter trainee shall identify and describe the general requirements, purpose, and definitions of the NFPA standard(s) applicable to Live Fire Training Evolutions.
- 125-1.00 The firefighter trainee shall identify the responsibilities of the firefighter which could assist in the subsequent investigation of a fire.
- 156-1.00 The firefighter trainee shall demonstrate procedures for testing fire hose.

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158-1.00 The firefighter trainee shall list and describe dangerous building conditions.

159-1.00 The firefighter trainee shall identify and define foam making appliances, and shall demonstrate a foam stream from each.

160-1.00 The firefighter trainee shall recognize the characteristics of ventilating a basement.

161-1.00 The firefighter trainee, operating as a member of a team, shall demonstrate the extrication of a victim from a vehicle.

162-1.00 The firefighter trainee shall identify the types of fire extinguishers in an occupancy and ensure that they conform to the fire prevention requirements for that occupancy.

163-1.00 The firefighter trainee shall identify and describe water systems and their fundamental components.

164-1.00 The firefighter trainee shall identify the features and characteristics of automatic sprinkler systems.

166-1.00 The firefighter trainee shall identify and be able to describe the purpose, goals, and definitions of the NFPA standards applicable to Hazardous Materials.

173-1.00 The firefighter trainee shall identify and describe the basic types of building construction and the general fire behavior expected with each type of construction.

174-1.00 The firefighter trainee shall extinguish or control live fires.

175-1.00 The firefighter trainee shall identify the methods for protecting evidence for fire cause determination.

176-1.00 The firefighter trainee shall identify and describe the purpose of an incident management system.

177-1.00 The firefighter trainee shall identify fire incident reporting systems.

178-1.00 The firefighter trainee shall identify and describe the benefits and components of pre-incident planning.

179-1.00 The firefighter trainee shall be able to describe various types of automotive fire apparatus, their functions, and their features.

180-1.00 The firefighter trainee shall identify various types of fire apparatus pumps and pump components, and shall identify their function(s), theory(s), and principle(s) of operation.

Course Outline

A. General

1. Organization of the fire department
 - a. History
 - b. Organizational structure
2. The role of the Fire Fighter I
3. Mission of the fire service
 - a. Emergency activities
 - b. Non-emergency activities
4. The value of life safety initiatives in support of the fire department mission and to reduce fire fighter line-of-duty injuries and fatalities

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- a. Courage To Be Safe So Everyone Goes Home
5. Role of other agencies as they relate to the fire department
 - a. Private entities
 - b. Local
 - c. Regional
 - d. State
 - e. Federal
6. Aspects of the fire department's member assistance program
 - a. Critical Incident Stress Management (CISM)
 - b. Member Assistance Programs (MAP)
7. Importance of physical fitness and a healthy lifestyle to the performance of duties of a fire fighter
8. The critical aspects of NFPA 1500, Standard on Fire Department Occupational Safety and Health Program
9. The combustion process and key terms associated with fire science
 - a. The four products of combustion commonly found in structural fires that create a life hazard
 - i. Flame
 - ii. Heat
 - iii. Smoke
 - iv. Gases and irritants
 - b. Key terms
 - i. Fire
 - ii. Flash point
 - iii. Ignition temperature
 - iv. Fire point
 - v. Flammable or explosive range
 - vi. LEL
 - vii. UEL
 - viii. Boiling point
 - ix. Oxidation
 - x. Pyrolysis
 - xi. Reducing agent
 - xii. Vaporization
 - xiii. Combustion
 - xiv. Vapor density
 - xv. Specific gravity
 - xvi. Thermal layering
 - xvii. heat stratification
 - xviii. thermal balance
10. Fire theory
 - a. Key terms
 - i. Fire triangle

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- ii. Fire tetrahedron
 - b. The relationship of the concentration of oxygen to combustibility and firefighter safety
 - i. Ventilation-limited fire conditions
 - ii. Flow paths
 - iii. Door control
11. Identify and describe heat energy sources
- a. Chemical heat energy
 - b. Electrical heat energy
 - c. Mechanical heat energy
 - d. Nuclear heat energy
12. The stages of a fire and describe the appropriate action to be taken for extinguishment
- a. Conditions and associated hazards and the appropriate actions to be taken for extinguishment
 - i. Ignition
 - ii. Growth
 - iii. Decay - oxygen depleted
 - iv. Flashover
 - v. Fully developed/fully involved
 - vi. Decay - fuel depleted
 - b. Special conditions that occur during a fire's growth
 - i. Flameover/rollover
 - ii. Thermal layering
 - iii. Ventilation-limited
 - iv. Backdraft
 - c. Methods of heat transfer
 - i. Conduction
 - ii. Convection
 - iii. Radiation
 - iv. Direct flame impingement
13. Physical states of matter in which fuels are commonly found
- a. Three types of fuel
 - i. Solid fuel
 - ii. Liquid fuel
 - iii. Gaseous fuel
 - b. Chemical and physical properties of fuels
 - i. Specific gravity
 - ii. Vapor density
 - iii. The theory of surface to mass ratio as it relates to the combustion process
14. Chemical by-products of combustion
- a. Poisonous gases and irritants common in smoke
 - i. Carbon dioxide

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- ii. Carbon monoxide
 - iii. Hydrogen cyanide
- 15. Units of heat measurement
 - a. British thermal unit (BTU)
 - b. Fahrenheit (°F)
 - c. Celsius (°C)
 - d. Calorie (C)
- 16. Fire extinguishment theory
 - a. fire extinguishment theory
 - b. four methods of extinguishment
 - i. Temperature reduction
 - ii. Fuel removal
 - iii. Oxygen exclusion
 - iv. Inhibiting chemical reaction
- 17. Characteristics of water as it relates to its fire extinguishing potential
 - a. physical characteristics of water
 - b. Law of Specific Heat
 - c. Law of Latent heat
 - d. advantages and disadvantages of water as an extinguishing agent
 - e. Law of Heat Flow
- B. General Skill Requirements
 - 1. Types of personal protective equipment (PPE) ensembles
 - a. Station/work uniforms
 - b. Structural firefighting
 - c. Wildland firefighting
 - d. Emergency medical service (EMS)
 - e. Specialized ensembles (i.e. ARFF, technical rescue)
 - 2. Donning
 - 3. Doffing/preparing for re-use
 - 4. Care and maintenance
 - a. Basic inspection
 - b. Advanced inspection
 - c. Record keeping
 - d. Familiarization with NFPA 1851
- C. Fire Department Communications
- D. Response to a reported emergency
 - 1. Procedures for reporting an emergency
 - a. Conventional phone
 - b. Cellular phone
 - c. Call box
 - d. Telecommunication Devices for the Deaf (TDD)
 - e. Still alarms or walk-ins
 - f. Automatic alarms

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2. Departmental SOPs for taking and receiving alarms
 - a. Nature of emergency
 - b. Location of emergency
 - c. Caller information
 - d. Responding units
 - e. Call back number
3. Radio codes or procedures
 - a. Clear speech – plain English
 - b. Emergency communications
 - i. Emergency communications per AHJ
 - ii. Mayday
 - iii. Evacuation order
4. Information needs of dispatch center
 - a. Nature of emergency
 - b. Location of emergency
 - c. Caller information
 - d. Responding units
 - e. Call back number
- E. Receive a telephone call
 1. Departmental standard operating procedures (SOPs)
 2. Phone etiquette
- F. Transmit and receive messages via the fire department radio
 1. Departmental radio procedures and etiquette for routine traffic
 2. Departmental radio procedures and etiquette for emergency traffic
 3. Departmental radio procedures and etiquette for emergency evacuation procedures
- G. Activate an emergency call for assistance, given vision-obscured conditions, PPE, and department SOPs, so that the fire fighter can be located and rescued.
 1. Personnel accountability systems
 - a. Passport
 - b. Tag system
 - c. Electronic system
 2. Emergency communication procedures
 - a. Radio
 - b. Face-to-face
 - c. Tagline
 - d. Evacuation signal
 3. Emergency evacuation methods
 - a. Roof escape
 - b. Balcony escape
 - c. Self-rescue
 - d. Ladder escape
 - e. Room escape

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H. Fireground Operations

I. Self-contained breathing apparatus (SCBA) during emergency operations

1. Conditions that require respiratory protection
 - a. Oxygen deficiency
 - b. Elevated temperatures
 - c. Toxic environments
 - d. Smoke (by-products of combustion)
2. Uses and limitations of SCBA
 - a. Wearer
 - i. Facial and long hair
 - ii. Protective clothing
 - iii. Donning
 - (a) Properly donned
 - (b) SCBA correctly worn
 - iv. Eyeglasses or contact lenses
 - v. Use in high or low temperatures
 - vi. Accidental submersion
 - vii. Communication
 - viii. Working in teams
 - ix. Personal alert safety system (PASS)
 - x. Doffing
 - xi. Physical conditioning
 - b. Equipment
 - c. Air supply
3. Types of SCBA
 - a. Open circuit
 - b. Closed circuit
 - c. Supplied air respirators (SARs)
4. Components of SCBA
 - a. Backpack and harness assembly
 - b. Air cylinder assembly
 - c. Regulator assembly
 - d. Face piece assembly
 - e. PASS device
 - f. Rapid Intervention Crew/Universal Air Connection (RIC/UAC)
5. Donning and doffing procedures
 - a. Over-the-head method
 - b. Coat method
 - c. Seat mounted
 - d. Compartment mounted
6. Breathing techniques
 - a. Controlled breathing
 - b. Buddy breathing

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7. Indications for and emergency procedures used with SCBA
 - a. Use of emergency by-pass or purge valve
 - b. Rapid Intervention Crew/Universal Air Connection (RIC/UAC)
 - c. Conservation of air
8. Physical requirements of the SCBA wearer
 - a. Cardiovascular conditioning
 - b. Respiratory conditioning
 - c. Psychological/emotional stability
9. Maintenance and inspections
 - a. Replacing a cylinder
 - b. Refilling a cylinder
 - c. Cleaning
 - d. Inspections
 - i. Daily
 - ii. Monthly
 - iii. Annually
- J. Respond on apparatus to an emergency scene
 1. Mounting procedures for riding fire apparatus
 - a. Hand grip
 - b. Footing
 - c. Seatbelt
 2. Dismounting procedures for riding fire apparatus
 3. Hazards associated with riding fire apparatus
 4. Ways to avoid hazards associated with riding fire apparatus
 - a. Seated and utilizing safety restraints
 - b. Hearing protection, if required
 - c. Secure loose objects in cab
 5. Prohibited practices
 - a. Donning PPE while in motion
 - b. Riding on the tailboard/sideboards
 6. Types of departmental personal protective equipment (PPE) and the means for usage
 - a. Safety bars/gates
 - b. Safety chains
- K. Establish and operate in work areas at emergency scenes
 1. Potential hazards involved in operating on emergency scenes
 - a. Vehicle traffic
 - b. Utilities
 - c. Environmental conditions
 2. Proper procedures for dismounting apparatus in traffic
 3. Procedures for safe operation at emergency scenes
 4. Protective equipment available for members' safety on emergency scenes
 5. Protective equipment available for members' safety on work zone designations

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- L. Force entry into a structure
 - 1. Basic construction types within the department's community or service area
 - a. Doors
 - i. Swinging doors
 - (a) Inward opening
 - (b) Outward opening
 - (c) Double swing
 - ii. Wooden doors
 - iii. Metal doors
 - iv. Tempered plate glass doors
 - v. Revolving doors
 - vi. Sliding doors
 - vii. Overhead doors
 - viii. Fire doors
 - b. Windows
 - i. Checkrail windows (double-hung)
 - ii. Casement windows (hinged)
 - iii. Projected windows (factory)
 - iv. Awning and jalousie windows
 - v. Plastic windows (high security)
 - vi. Screened or barred windows
 - c. Walls
 - i. Masonry and veneered walls
 - ii. Metal walls
 - iii. Wood frame walls
 - iv. Partition walls
 - 2. Operation
 - a. Doors
 - b. Windows
 - c. Locks
 - 3. Dangers associated with forcing entry
 - a. Through doors
 - b. Through windows
 - c. Through walls
 - 4. Tools
 - a. Cutting tools
 - b. Prying tools
 - c. Pushing/pulling tools
 - d. Striking tools
 - 5. Maintenance of tools
 - a. Axe heads and cutting edges
 - b. Wooden handles

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- c. Fiberglass handles
- d. Unprotected metal surfaces
- e. Power equipment
- M. Exit a hazardous area as a team
 - 1. Personnel accountability systems
 - a. Passport
 - b. Tag system
 - c. Electronic system
 - 2. Communication procedures
 - a. Radio
 - b. Face-to-face
 - c. Tagline
 - d. Evacuation signal
 - 3. Emergency evacuation methods
 - a. Roof escape
 - b. Balcony escape
 - c. Self-rescue
 - d. Ladder escape
 - e. Room escape
 - 4. What constitutes a safe haven/refuge
 - a. Absence of immediately dangerous to life and health (IDLH) hazard
 - b. Area outside of collapse zone
 - 5. Elements that indicate or create a hazard
 - 6. Emergency procedures for loss of air supply
 - a. Stay calm/don't panic
 - b. Activate PASS device
 - c. Declare Mayday
- N. Set up ground ladders
 - 1. Parts of a ladder
 - a. Beam
 - b. Bed section
 - c. Butt
 - d. Butt spur
 - e. Fly section
 - f. Guides
 - g. Halyard
 - h. Heat sensor label
 - i. Hooks
 - j. Pawls (dogs)
 - k. Protection plates
 - l. Pulley
 - m. Rail

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- n. Rung
 - o. Staypole
 - p. Stops
 - q. Tie rod
 - r. Tip
2. Hazards associated with setting up ladders
 - a. Overhead obstruction (energized power lines)
 - b. Lifting and moving
 - c. Uneven terrain
 - d. Soft spots
 - e. High traffic areas (doorways)
 - f. Exposure to flame or heat
 3. What constitutes a stable foundation for ladder placement
 - a. Flat, stable surface
 - b. Non-skid surface
 4. Different angles for various tasks
 - a. Roof
 - b. Window
 - i. Entry
 - ii. Ventilation or working
 - iii. Rescue set
 5. Safety limits to the degree of angulation
 6. What constitutes a reliable structural component for top placement
- O. Attack a passenger vehicle fire operating as a member of a team
1. Principles of fire streams as they relate to vehicle fires
 - a. Straight stream
 - b. Full fog
 - c. Power cone
 2. Precautions to be followed when advancing hose lines toward a vehicle
 - a. Uphill
 - b. Upwind
 - c. 45 degree angle approach
 3. Observable results that a fire stream has been properly applied
 4. Identifying alternative fuels and the hazards associated with them
 - a. Compressed Natural Gas (CNG)
 - b. Liquefied Petroleum Gas (LPG)
 - c. Ethanol
 - d. High voltage electrical power
 5. Dangerous conditions created during a vehicle fire
 - a. Energy absorbing bumpers
 - b. Hydraulic pistons (supports)
 - i. Hatchbacks
 - ii. Trunks

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- iii. Tailgates
- iv. Hoods
- c. Shock absorbers/struts
- d. Toxic by-products of combustion
- e. Supplemental Restraint System (SRS)
- f. Side Impact Protection System (SIPS)
- g. Batteries
- h. Combustible metals
- 6. Common types of accidents or injuries related to fighting vehicle fires and how to avoid them
 - a. Traffic hazards
 - b. Injuries
 - c. Respiratory
- 7. Access compartments
 - a. Passenger
 - b. Trunk
 - c. Engine
- 8. Methods for overhauling a vehicle
 - a. Chock wheels
 - b. Disable battery
 - c. Apply water thoroughly
 - d. Confirm no leaking fluids or fuels
- P. Extinguish fires in exterior Class A materials
 - 1. Types of attack lines and water streams appropriate for attacking stacked, piled materials and outdoor fires
 - a. Types of attack lines
 - i. $\frac{3}{4}$ or 1 inch (booster or reel line)
 - ii. $1\frac{1}{2}$ to $1\frac{3}{4}$ inches
 - iii. 2 to $2\frac{1}{2}$ inches
 - iv. 3 inch or greater
 - b. Water streams
 - i. Low volume (less than 40 GPM)
 - ii. Handline (40 to 350 GPM)
 - iii. Master (350 GPM or greater)
 - 2. Dangers associated with stacked and piled materials
 - a. Collapse
 - b. Energized sources
 - c. Products of combustion
 - d. Increased weight (absorption of water)
 - e. Exposures
 - 3. Various extinguishing agents and their effects on different material configurations
 - a. Water
 - i. Cooling

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- ii. Increased surface tension
 - b. Foam
 - i. Blanketing or smothering
 - ii. Cooling
 - iii. Decreased surface tension
- 4. Tools and methods to use in breaking up various types of materials
 - a. Tools
 - i. Pike pole
 - ii. Rubbish hook
 - iii. Rake
 - b. Heavy equipment
 - i. Tractor
 - ii. Dozer
- 5. Difficulties related to complete extinguishment of stacked and piled materials
 - a. Agent penetration
 - b. Access
 - c. Density of material
 - d. Height and area of pile
- 6. Water application methods for exposure protection and fire extinguishment
 - a. Direct application
 - b. Indirect application
- 7. Dangers such as exposure to toxic or hazardous materials associated with storage building and container fires
- 8. Obvious signs of origin and cause
 - a. Burn pattern
 - b. Charring
 - c. Evidence of accelerants
 - d. Trailers
- 9. Techniques for the preservation of fire cause evidence
 - a. Protect evidence
 - b. Preserve area
 - c. Limit access
- Q. Conduct a search and rescue in a structure
 - 1. Use of forcible entry tools during rescue operations
 - a. Striking
 - b. Prying
 - c. Cutting
 - d. Pulling
 - 2. Ladder operations for rescue
 - a. Conscious victim
 - b. Unconscious victim
 - c. Fire fighter rescue

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3. Psychological effects of operating in obscured conditions and ways to manage them
4. Methods to determine if an area is tenable
 - a. Level of heat
 - b. Smoke
 - c. Ventilation-limited fire conditions
 - d. Creation of flow paths
 - e. Structural stability
 - f. Risk/benefit analysis
5. Primary and secondary search techniques
 - a. Define the following
 - i. Primary search
 - ii. Secondary search
 - b. Search techniques
 - i. Right hand/left hand
 - ii. Large area/small area considerations
 - iii. Rope assisted, or hose line
 - iv. Tools (used to extend reach during search)
 - v. Vent-Enter-Isolate-Search (VEIS)
6. Team members' roles and goals
 - a. Finding victims
 - b. Obtaining information on the extent of the fire
 - c. Search priorities
 - i. Closest to fire area
 - ii. Remainder of fire floor
 - iii. Floor above
 - iv. Floor below
 - d. Rescue vs. recovery
7. Methods to use and indicators of finding victims
 - a. Probable victim locations
 - i. Behind doors
 - ii. Under windows
 - iii. On/under beds
 - iv. In closets
 - v. In bathtubs
 - b. Additional considerations
 - i. Type of occupancy
 - ii. Time of day
 - iii. Building size and arrangement
 - iv. Information from neighbors
 - v. Occupant indicators
 - (a) Vehicles in driveway
 - (b) Toys in yard

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- c. Call out/listen
- d. Victim sighting through opening (i.e. window/door)
- e. Door control to prevent flow paths
- 8. Victim removal methods
 - a. Types of carries
 - i. Extremity carry
 - ii. Seat carry
 - iii. Chair carry
 - iv. Webbing drag
 - v. Blanket drag
 - vi. Ladder rescue
 - (a) Conscious
 - (b) Unconscious
 - b. Securing of a victim
 - i. Basket
 - ii. Stretcher
 - iii. Long spine board
 - iv. Other devices
- 9. Considerations related to respiratory protection
 - a. Personal use/work time
 - b. Emergency procedures
 - c. Rescue air/RIT pak
 - d. Conditions for use
 - i. Heat
 - ii. Smoke
 - iii. Oxygen deficiency
 - iv. Toxic atmospheres
- R. Attack an interior structure fire operating as a member of a team
 - 1. Principles of fire streams
 - a. Definitions
 - i. Pressure
 - ii. Friction loss
 - iii. Elevation loss/gain
 - iv. Fire stream
 - v. Vaporization
 - vi. Latent heat vaporization
 - vii. British Thermal Unit (BTU)
 - viii. Water hammer
 - b. Fire streams
 - i. Low-volume stream
 - ii. Handline stream
 - iii. Master stream
 - iv. Cooling/extinguishing properties

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2. Types of nozzles
 - a. Solid stream
 - i. Types
 - ii. Advantages
 - iii. Disadvantages
 - iv. Flow rate
 - b. Fog stream
 - i. Types
 - ii. Advantages
 - iii. Disadvantages
 - iv. Flow rate
 - v. Water flow adjustment
 - (a) Manually adjustable
 - (b) Automatic (constant-pressure)
 - vi. Stream patterns
 - (a) Straight stream
 - (b) Narrow fog
 - (c) Wide fog
 - vii. Broken stream
 - (a) Types
 - (b) Advantages
 - (c) Disadvantages
 - (d) Flow rate
 - c. Specialty nozzles
 - i. Types
 - ii. Advantages
 - iii. Disadvantages
 - iv. Flow rate
3. Design of nozzles
 - a. Solid stream nozzle
 - i. Components/parts
 - ii. Operating pressure
 - (a) 50 psi hand line
 - (b) 80 psi master stream
 - b. Fog stream nozzle
 - i. Components/parts
 - ii. Operating pressure
 - (a) 100 psi hand line
 - (b) 50-75 psi low pressure hand line
 - (c) 100 psi master stream
 - c. Broken stream nozzle
 - i. Components/parts

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- ii. Operating pressure varies by design
- 4. Operation of nozzles
 - a. Operating valves
 - i. Ball valve
 - ii. Slide valve
 - iii. Rotary control valve
 - b. Flow selection
 - i. Automatic
 - ii. Adjustable
 - iii. Fixed
- 5. Nozzle pressure effects
 - a. Reach
 - i. Solid stream
 - ii. Fog stream
 - iii. Broken stream
 - b. Nozzle reaction
 - i. Solid stream
 - ii. Fog stream
 - iii. Broken stream
 - c. Water pattern
 - i. Solid stream
 - ii. Straight stream
 - iii. Narrow fog
 - iv. Wide fog
 - v. Broken stream
 - d. Flow paths caused by air entrainment
 - i. Solid or straight streams
 - ii. Fog streams
- 6. Flow capabilities of nozzles
 - a. Low volume nozzles – 40 GPM or less
 - b. Hand line nozzles – 40-350 GPM
 - c. Master stream nozzles – 350 GPM and above
- 7. Precautions to take when advancing hose lines to a fire
 - a. Into a structure
 - b. Up a stairway
 - c. Down a stairway
 - d. From a standpipe
 - e. Up a ladder
- 8. Observable results that a fire stream has been properly applied
 - a. Direct attack
 - i. Smoke
 - ii. Heat
 - iii. Flame

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- b. Indirect attack
 - i. Smoke
 - ii. Heat
 - iii. Flame
 - iv. Patterns
 - (a) T pattern
 - (b) Z pattern
 - (c) O pattern
 - c. Combination attack
 - i. Smoke
 - ii. Heat
 - iii. Flame
 - iv. Patterns
 - (a) T pattern
 - (b) Z pattern
 - (c) O pattern
9. Dangerous building conditions created by fire
- a. Flashover
 - b. Rollover
 - c. Ventilation-limited
 - d. Backdraft
 - e. Smoke explosion
 - f. Imminent building collapse
 - g. Fire behind, below, or above attack team
 - h. Kinks or obstructions to the hose line
 - i. Holes, weak stairs, or other fall hazards
 - j. Suspended loads on fire-weakened supports
 - k. Hazardous or highly flammable commodities likely to spill
 - l. Electrical shock hazards
10. Principles of exposure protection
- a. Conduction
 - b. Convection
 - c. Radiation
 - d. Direct flame impingement
11. Potential long-term consequences of exposure to products of combustion
- a. Respiratory diseases
 - b. Cardiovascular diseases
 - c. Stroke
 - d. Cancer
 - e. Death
12. Physical states of matter in which fuels are found
- a. Solid
 - b. Liquid

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- c. Gaseous
- 13. Common types of accidents or injuries and their causes
 - a. Common injuries
 - b. Common activities
 - c. Common causes
 - i. Slips, trips, falls
 - ii. Failure to wear proper PPE
 - iii. Failure to follow safety procedures
- 14. Application of each size and type of attack line
 - a. 30-350 GPM
 - b. 1½” to 3” hose lines
 - c. AHJ
- 15. The role of the backup team in fire attack situations
 - a. “Two-in/two-out” rule
 - b. Fire fighter rescue
 - c. AHJ
- 16. Attack and control techniques for grade level, above grade level and below grade level
 - a. Grade level
 - i. Single story structures
 - ii. Large single story structures
 - b. Above grade level
 - i. Multi-story structures
 - ii. Low-rise
 - iii. Mid-rise
 - iv. High-rise
 - c. Below grade level
 - i. Basements
 - ii. Vaults
 - d. Coordinating fire attack with ventilation
 - e. Exterior offensive attack
 - i. Blitz attack
 - ii. Transitional attack
 - iii. Softening the target
- 17. Exposing hidden fires
 - a. Overhaul techniques
 - i. Opening walls
 - ii. Opening floors
 - iii. Opening ceilings
 - b. Other concealed spaces – special considerations
 - i. Utility chutes/shafts
 - ii. Cocklofts
 - iii. Attics

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- iv. Basements
- v. Other
- S. Perform horizontal ventilation on a structure operating as part of a team
 - 1. Principles, advantages, limitations and effects of horizontal, mechanical and hydraulic ventilation
 - a. Purposes
 - i. Life safety
 - ii. Fire attack and extinguishment
 - iii. Fire spread control
 - iv. Reduce flashover potential
 - v. Reduce backdraft potential
 - vi. Property conservation
 - b. Types of horizontal ventilation
 - i. Natural
 - ii. Mechanical
 - (a) Positive pressure
 - (b) Negative pressure
 - (c) Hydraulic
 - c. Advantages
 - i. Natural
 - ii. Mechanical
 - (a) Positive pressure
 - (b) Negative pressure
 - (c) Hydraulic
 - d. Limitations
 - i. Natural
 - ii. Mechanical
 - (a) Positive pressure
 - (b) Negative pressure
 - (c) Hydraulic
 - e. Effects
 - i. Natural
 - ii. Mechanical
 - (a) Positive pressure
 - (b) Negative pressure
 - (c) Hydraulic
 - 2. Safety considerations when venting a structure
 - a. Life safety hazards
 - b. Determining the location and extent of the fire
 - c. Identifying building construction features
 - d. Flow paths
 - e. Predicting fire travel and growth

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3. Fire behavior in a structure
 - a. Products of combustion
 - b. Behavior of heat, smoke and fire gases
 - c. Airflow characteristics
4. Products of combustion found in a structure fire
 - a. Heat
 - b. Smoke
 - c. Gases and irritants
5. Backdrafts
 - a. Signs
 - b. Causes
 - c. Effects
 - d. Prevention
6. Relationship of oxygen concentration to life safety and fire growth
 - a. Firefighter safety
 - b. Victim safety
- T. Perform vertical ventilation on a structure as part of a team
 1. Methods of heat transfer
 - a. Conduction
 - b. Convection
 - c. Radiation
 - d. Direct flame impingement
 2. Principles of thermal layering within a structure on fire
 - a. Definition of thermal layering (i.e. heat stratification, thermal balance)
 - b. Thermal layering as it relates to ventilation
 - c. Thermal layering in relation to life safety/rescue
 3. Roof Styles
 - a. Flat
 - b. Pitched
 - c. Hip
 - d. Gable
 - e. Mansard
 - f. Shed
 - g. Butterfly
 - h. Gambrel
 4. Techniques and safety precautions for venting flat roofs
 - a. Weather conditions
 - b. Determining need
 - c. Exposures
 - d. Obstructions/weight on roof
 - e. Maintain structural support integrity during cut
 - f. PPE
 - g. Tools

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- h. Ladder placement
 - i. Sounding roof
 - j. Slips, trips, and falls
 - k. Reduced visibility
 - l. Equipment safety
 - m. Location of vent cut
 - n. Secondary means of escape
 - o. Personnel
 - p. Types of cuts
5. Techniques and safety precautions for venting pitched roofs
- a. Angle of pitch
 - b. Weather conditions
 - c. Determining need
 - d. Exposures
 - e. Obstructions/weight on roof
 - f. Maintain structural support integrity during cut
 - g. PPE
 - h. Tools
 - i. Ladder placement
 - j. Sounding roof
 - k. Slips, trips, and falls
 - l. Reduced visibility
 - m. Equipment safety
 - n. Location of vent cut
 - o. Secondary means of escape
 - p. Personnel
 - q. Types of cuts
6. Techniques and safety precautions for venting basements
- a. Determining need
 - b. Exposures
 - c. Obstructions/weight on floor above
 - d. Maintain structural support integrity during cut
 - e. PPE
 - f. Tools
 - g. Slips, trips, and falls
 - h. Reduced visibility
 - i. Equipment safety
 - j. Location of ventilation openings
 - k. Personnel
7. Basic indicators of potential collapse or roof failure
- a. Construction
 - i. Solid beam
 - ii. Light weight trusses

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- b. Size up
 - i. Sagging roof
 - ii. Spongy roof
 - iii. Melting tar
 - iv. Smoke seepage
 - v. Visible fire
- c. Elapsed time of fire
- 8. Effects of construction type
 - a. Structural integrity
 - b. Fire spread
- 9. Elapse time under fire conditions on structural integrity
- 10. Vertical ventilation
 - a. Advantages
 - b. Disadvantages
- 11. Trench/strip ventilation
 - a. Advantages
 - b. Disadvantages
- U. Overhaul a fire scene
 - 1. Types of fire attack lines and water application devices most effective for overhaul
 - a. Attack lines
 - b. Fire extinguishers
 - c. Buckets and basins
 - d. SOPs per AHJ
 - 2. Water application methods for extinguishment that limit water damage
 - a. Water conservation
 - b. Soaking in buckets and basins
 - 3. Types of tools to expose hidden fire
 - a. Prying and pulling tools
 - b. Cutting tools
 - c. Striking tools
 - d. Power tools
 - e. Thermal imaging camera
 - 4. Methods to expose hidden fires
 - a. Sight
 - b. Touch
 - c. Sound
 - d. Electronic instruments
 - 5. Dangers associated with overhaul
 - a. Toxic atmospheric conditions
 - b. Weakened floors and structural members
 - c. Sharp objects and debris
 - d. Utilities

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- e. Slippery surfaces
- 6. Obvious signs of area of origin or signs of arson
 - a. Burn patterns
 - b. Smoke markings
 - c. Physical evidence
- 7. Reasons for protection of fire scene
 - a. Securing the scene
 - b. Preservation of evidence
- V. Conserve property
 - 1. The purpose of property conservation and its value to the public
 - 2. Methods used to protect property
 - a. Removal of property
 - b. Protection of property in place
 - 3. Types and uses of salvage covers
 - a. Types
 - b. Uses
 - i. Cover property
 - ii. Construct basins, chutes and catchalls
 - iii. Floor runners
 - iv. Debris removal
 - 4. Operations at properties protected with automatic sprinklers
 - 5. How to stop the flow of water from an automatic sprinkler head
 - a. Sprinkler stops and wedges
 - b. Operate main control valves
 - 6. Identification of the main control valve on an automatic sprinkler system
 - a. Sprinkler riser
 - b. Indicating valves
 - i. Outside stem and yoke (OS&Y)
 - ii. Butterfly valve
 - iii. Wall post indicator valve (WPIV)
 - iv. Post indicator valve (PIV)
 - v. Post indicator valve assembly (PIVA)
 - 7. Forcible entry issues related to salvage
 - a. Utilize forcible entry only when necessary
 - b. Try before you pry
- W. Connect a fire department pumper to a water supply
 - 1. Loading and off-loading procedures for mobile water supply apparatus (AHJ)
 - a. Portable water tanks
 - b. Drafting and siphoning appliances
 - c. Relay pumping apparatus
 - d. Fill apparatus and drafting appliances
 - e. Portable pumps

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- f. Fire hydrant appliances
- g. Dry hydrants or suction supply points
- 2. Fire hydrant operation
 - a. Types
 - i. Dry barrel hydrant
 - ii. Wet barrel hydrant
 - b. Color coding
 - i. Class AA light blue
 - ii. Class A green
 - iii. Class B orange
 - iv. Class C red
- 3. Suitable static water supply sources
 - a. Lakes
 - b. Rivers
 - c. Streams
 - d. Ponds
 - e. Pools
- 4. Procedures protocol for connecting to various water sources
 - a. Hydrant to pumper connection
 - i. Forward hose lay
 - ii. Reverse hose lay
 - b. Drafting
- X. Extinguish incipient Class A, Class B, and Class C
 - 1. Classifications of fire
 - a. Class A – ordinary combustible materials
 - b. Class B – flammable and/or combustible liquids and gases
 - c. Class C – energized electrical equipment
 - d. Class D – combustible metals
 - e. Class K – combustible cooking oils
 - 2. Types of fire
 - a. Combustible materials
 - b. Flammable liquids and gases
 - c. Energized electrical equipment
 - d. Combustible metals
 - e. Combustible cooking oils
 - 3. Rating systems for fire
 - a. Class A test
 - i. Wood panel
 - ii. Wood crib
 - b. Class B test
 - i. Pan of flammable liquid
 - ii. n-heptane used
 - c. Class C test

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- i. Applies to energized electrical fires only
 - ii. De-energized equipment is treated as a class A, B or D fire
 - d. Class D test
 - i. Metal fires only
 - ii. Dry powder agent must be formulated to the specific metal
 - e. Class K test
 - i. Cooking oil fires
 - ii. Uses a specialized extinguishing agent
 - 4. Operating methods of portable extinguishers
 - a. Acronym PASS
 - i. Pull
 - ii. Aim
 - iii. Squeeze
 - iv. Sweep
 - b. Distance from the fire
 - 5. Limitations of portable extinguishers
 - a. Type of agent for fire
 - b. Size of extinguisher for fire
- Y. Illuminate the emergency scene
- 1. Safety principles and practices
 - a. Safely lifts equipment during set up
 - b. Locates the power plant in a remote and well-ventilated position
 - c. Arranges power cords neatly to minimize tripping hazards
 - d. Ground Fault Interrupter (GFI) operations
 - 2. Power supply capacity and limitations
 - a. Power supply (portable or mounted)
 - b. Lights
 - c. Auxiliary equipment
 - d. Cords
 - e. Connectors
 - 3. Light deployment methods
 - a. Organizes lights to illuminate area sufficiently
 - b. Follow equipment operating guidelines
- Z. Turn off building utilities
- 1. Electrical systems
 - a. Properties
 - b. Principles
 - c. Safety concerns
 - 2. Gas systems
 - a. Properties
 - b. Principles
 - c. Safety concerns

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3. Water systems
 - a. Properties
 - b. Principles
 - c. Safety concerns
 4. Utility disconnect methods
 - a. Electrical
 - i. Electric meter
 - ii. Main breaker box
 - b. Natural gas meter
 - c. Water meter
 5. Dangers associated with utility disconnect methods
 - a. Electrocution
 - b. Fire/explosion
 6. Use of required safety equipment (AHJ)
- AA. Combat a ground cover fire
1. Types of ground cover fires
 - a. Crown fire – aerial fuel
 - b. Surface fire – surface fuel
 - c. Subsurface fire – subsurface fuel
 2. Parts of ground cover fires
 - a. Head
 - b. Origin
 - c. Heel
 - d. Flanks
 - e. Fingers
 - f. Spot fires
 - g. Island
 - h. Perimeter
 - i. Green
 - j. Black
 3. Methods to contain or suppress
 - a. Direct attack
 - b. Indirect attack
 4. Safety principles and practices
 - a. Proper use of PPE
 - b. Proper use of tools
 - c. Scene hazard awareness
 5. Factors influencing the spread of ground fires
 - a. Weather
 - b. Topography
 - c. Fuel
- BB. Tie a knot appropriate for hoisting tool
1. Knot types and use

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- a. Safety knot or overhand knot
- b. Half hitch
- c. Clove hitch
- d. Figure 8
- e. Figure 8 on a bight
- f. Figure 8 with a follow through
- g. Bowline
- h. Sheet bend or becket bend
2. Differentiating between life safety and utility rope
 - a. Natural
 - b. Synthetic
3. Reasons for placing rope out of service
 - a. Inspection
 - i. Routine
 - ii. After use
 - b. Storage
 - c. Maintenance
4. Types of knots used for given tools, ropes or situations
 - a. Hoisting an axe
 - b. Pike pole
 - c. Hose
 - d. Ladder
 - e. Power tools or fans
5. Hoisting methods for tools and equipment
6. Using rope to support response activities
 - a. Utility
 - b. Life safety/rescue
- CC. Rescue Operations
- DD. Preparedness and Maintenance
- EE. Clean and check ladders, ventilation equipment, SCBA, ropes, salvage equipment, and hand tools
 1. Types of cleaning methods for various tools and equipment
 - a. Ladders
 - b. Ventilation equipment
 - c. SCBA
 - d. Ropes
 - e. Salvage equipment
 - f. Hand tools
 2. Correct use of cleaning solvents
 - a. Mild diluted detergent
 - b. Safety solvent
 - c. Water
- FF. Clean, inspect, and return fire hose to service

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1. Departmental procedures for noting a defective hose and removing it from service (AHJ)
 2. Cleaning methods
 - a. Rinse
 - b. Gently scrub with mild detergent
 - c. Final rinse
 3. Hose rolls
 - a. Straight roll
 - b. Donut roll
 - c. Twin donut roll
 - d. Self-locking twin donut roll
 4. Hose loads
 - a. Forward lay
 - b. Reverse lay
 - c. Accordion load
 - d. Horseshoe load
 - e. Reverse horseshoe load
 - f. Flat load
 - g. Triple layer load
 - h. Minuteman load
 - i. Booster hose load (reel)
- GG. Responsibilities of the Fire Fighter II in assuming and transferring command within an incident management system
1. Identify and describe the purpose of an Incident Management System
 - a. Common terminology
 - b. Modular organization
 - c. Integrated communications
 - d. Unified command structure
 - e. Consolidated action plans
 - f. Manageable span of control
 - g. Predesignated incident facilities
 - h. Comprehensive resource management
 2. Functions necessary to manage an incident effectively and the responsibilities within the Incident Management System
 - a. Command
 - b. Safety
 - c. Liaison
 - d. Information
 - e. Operations
 - f. Planning
 - g. Logistics
 - h. viii. Finance/Administration

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3. Components and functions of the operations section within the Incident Management System
 - a. Incident Command
 - b. Staging
 - c. Branches
 - d. Divisions and Groups
 - e. Strike Teams and Task Forces
 - f. Single Resources
 4. Procedure for implementing the Incident Management System
 - a. Hazard and risk analysis
 - i. What has occurred?
 - ii. What is the current status of the emergency? iii. Is anyone trapped or injured?
 - iii. Can the emergency be handled with the resources on scene or en route?
 - iv. Does the emergency fall within the scope of the individual's training?
 - b. Risk vs. benefit
 5. Establishing command and the transfer of command
 - a. First on scene
 - i. Investigation
 - ii. Command
 - iii. Pass command for fast attack/rescue
 - b. Considerations for transfer of command
 - i. Arrival of senior staff
 - ii. Specialized incident
 - iii. Resource requirements
 - iv. Time restraints
 - v. Demobilization
 - c. Methods of transferring command
 - i. Face-to-face
 - ii. Via radio
 6. Transferring command
 - a. Situation status report (sit stat)
 - b. Communicating transfer of command
- HH. Fire Department Communications
- II. performing activities related to initiating and reporting responses
- JJ. Complete a basic incident report
1. Content requirements for basic incident reports
 - a. National Fire Incident Reporting System (NFIRS)
 - b. Texas fire incident reporting system (TXFIRS)
 2. Purpose of accurate reports
 - a. A legal record of an incident
 - b. Consistent format for the collection of data usable at the state and national level

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3. Usefulness of accurate reports
 - a. Provides information to officials for evaluation performance and making changes
 - b. Aids in determining departmental needs
4. Consequences of inaccurate reports
 - a. Incorrect data
 - b. Litigation
5. How to obtain necessary information
 - a. Person or entity involved
 - b. Owner
 - c. Bystanders or eye witnesses
 - d. Dispatch
 - e. Equipment involved in ignition
 - f. Fire fighters on scene
6. Required coding procedures
 - a. NFIRS
 - b. TXFIRS
- KK. Communicate the need for team assistance
 1. Alarm assignment SOP
 2. Fire department radio communication procedures
- LL. Fireground Operations
- MM. Extinguish an ignitable liquid fire, operating as a member of a team
 1. Methods by which foam prevents a hazard
 - a. Blanketing effect
 - b. Vapor suppression
 2. Methods by which foam controls a hazard
 - a. Heat resistance
 - b. Fuel resistance
 - c. Vapor suppression
 3. Principles by which foam is generated
 - a. Components of finished foam
 - i. Foam solution
 - (a) Foam concentrate
 - (b) Water
 - ii. Air (aeration/mechanical agitation at the nozzle)
 - b. Water + concentrate = foam solution
 - c. Foam solution + air = finished foam
 4. Methods by which foam is generated
 - a. Foam eductor
 - i. Venture principle
 - ii. In-line eductor
 - iii. Bypass eductor
 - b. Around the pump foam proportioner
 - c. Balanced pressure foam system

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- d. Premix
- 5. Cause for poor foam generation
 - a. Foam concentrate/fuel type mismatch
 - b. Fuel area and depth
 - c. Wrong application rate
 - d. Inadequate water supply, or pressure
 - e. Foam eductor type and setting
 - f. Nozzle type and setting
 - g. Back pressure
- 6. Corrective measures for poor foam generation
 - a. Identify fuel type
 - i. Hydrocarbon
 - ii. Polar solvent
 - b. Determine fuel depth and surface area
 - c. Determine application rate (GPM/ft²)
 - d. Acquire adequate supply of foam concentrate
 - e. Establish water supply and correct pressure
 - f. Verify proper eductor operation
 - i. Setting (i.e. 1%, 3%, 6%)
 - ii. Concentrate pick-up tube
 - g. Nozzle flow matches eductor capability (GPM) and provides aeration
 - h. Check for hose kinks and/or blockage
 - i. Assure nozzle is fully open
- 7. Differentiating between hydrocarbon and polar solvent fuels
 - a. Hydrocarbon fuels
 - i. Examples
 - ii. Concentrate types
 - iii. Concentrate percentage and application rate
 - b. Polar solvent fuels
 - i. Examples
 - ii. Concentrate types
 - iii. Concentrate percentage and application rate
- 8. Advantages, uses and limitations of fire-fighting foams
 - a. Protein
 - i. High water retention and heat resistance
 - ii. Effective vapor suppression
 - iii. Limited shelf life
 - iii. Poor fuel resistance
 - iv. Slow knockdown
 - v. Poor compatibility with dry chemical agents
 - b. Fluoroprotein
 - i. Excellent fuel resistance
 - ii. Compatible with specific dry chemical agents

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- iii. High heat resistance
- iv. Requires use of foam nozzle
- c. Film Forming Fluoroprotein (FFFP)
 - i. Fast film-forming capability
 - ii. High heat resistance
- d. Aqueous Film Forming Foam (AFFF) / Alcohol Type Concentrate (ATC)
 - i. Fast film-forming capability
 - ii. Applied with regular fog nozzles
 - iii. Compatible with specific dry chemical agents
 - iv. ATC suitable for polar solvent fuel fires
 - v. Quick drain-down may require continued application
- e. High-expansion foam
 - i. Reduces surface tension of water
 - ii. Excellent penetration into Class A materials
 - iii. Poor heat resistance
- f. Class A foams
 - i. Reduces surface tension of water
 - ii. Foamy water solution clings to surfaces
 - iii. Fast extinguishment
 - iv. Requires a more accurate proportioning system
 - v. Impacts fire investigation laboratory tests
 - vi. Creates difficult salvage operations
- 9. Advantages and disadvantages of using fog nozzles
 - a. Suitable for use with AFFF and Class A foams
 - b. Not suitable for use with protein and fluoroprotein foams
 - c. Use of expansion tubes
 - d. Reduced reach when flowing foam
- 10. Advantages and disadvantages of using foam nozzles
 - a. Creates highest quality of foam
 - b. Must be used with protein and fluoroprotein foam
 - c. Stream reach less than a standard fog nozzle
- 11. Foam stream application techniques
 - a. Roll-on technique
 - b. Bank-down technique
 - c. Rain-down technique
- 12. Hazards associated with foam usage
 - a. Mildly irritating
 - b. Mildly corrosive
 - c. Environmental impact
 - d. Limited foam stream reach
- 13. Methods to reduce or avoid hazards
 - a. Flush affected areas with water
 - b. Control run-off

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- c. Additional exposure lines for personnel protection
- NN. Coordinate an interior attack line for a team's accomplishment of an assignment in a structure fire
 - 1. Selection of the nozzle for fire attack
 - a. Handlines
 - i. Fog nozzles
 - ii. Solid stream
 - iii. Broken stream
 - b. Master streams
 - i. Fog nozzles
 - ii. Solid stream
 - 2. Selection of the hose for fire attack
 - a. Small diameter ($\frac{3}{4}$ ", 1", 1½", 1¾", 2") handlines
 - b. Medium diameter (2½", 3") handlines
 - c. Medium (2½", 3") or large diameter hose (3½", 4", 5", 6") for master stream support
 - 3. Selection of adapters and appliances to be used for specific fire ground situations
 - a. Wyes – gated and non-gated
 - b. Siamese – clapper and non-clapper
 - c. Water thief
 - d. Manifold (portable hydrant)
 - e. Hydrant valve
 - f. Double male
 - g. Double female
 - h. Reducers
 - i. Adapters
 - i. Adapts one thread type to another
 - ii. Adapts threaded couplings to sexless couplings
 - 4. Dangerous building conditions created by fire and fire suppression activities
 - a. Dangerous fire conditions in a building
 - i. Ventilation-limited
 - ii. Flashover
 - iii. Backdraft
 - b. Conditions that contribute to the spread and intensity of the fire
 - i. Fire loading
 - ii. Combustible furnishings and finishes
 - iii. Roof coverings
 - iv. Wooden floors and ceilings
 - v. Large, open spaces
 - c. Conditions that make the building susceptible to collapse
 - i. Damage to structural system of the building from fire or firefighting activities
 - ii. Age of the building

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- iii. Lightweight or truss construction
- iv. Older buildings exposed to weather
- v. Firefighting operations
 - (a) Improper vertical ventilation
 - (b) Added weight of water used for fire extinguishment
- 5. Indicators of building collapse
 - a. Deterioration of mortar joints
 - b. Overall age and condition of the building
 - c. Cracks in walls, floors, ceilings, and roofs
 - d. Signs of building repair (tie rods and stars)
 - e. Large open spans
 - f. Bulges, bowing and leaning of walls
 - g. Sagging floors
 - h. Abandoned buildings
 - i. Large volume of fire
 - j. Extended firefighting operations
 - k. Smoke coming from cracks in walls
 - l. Dark smoke from truss roof or floor spaces
 - m. Multiple fires in same building or damage from previous fires
- 6. Effects of fire suppression activities on:
 - a. Wood
 - b. Masonry (brick, block, stone)
 - c. Cast iron
 - d. Steel
 - e. Reinforced concrete
 - f. Gypsum wallboard
 - g. Glass
 - h. Plaster on lath
- 7. Search and rescue procedures
 - a. Define the following
 - i. Primary search
 - ii. Secondary search
 - b. Search techniques
 - i. Right hand/left hand
 - ii. Large area/small area considerations
 - iii. Rope assisted, or hose line
 - iv. Use of tools
 - (a) To extend reach
 - (b) Door chocks or door/latch straps
 - (c) Thermal imaging cameras
 - v. Vent-Enter-Isolate-Search (VEIS)
 - vi. Communication during search
 - vii. Search marking systems

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8. Ventilation procedures
 - a. Door control
 - b. Types
 - i. Natural
 - ii. Mechanical
 - (a) Positive pressure
 - (b) Negative pressure
 - (c) Hydraulic
 - c. Techniques
 - i. Horizontal
 - ii. Vertical
 - d. Coordinate with fire attack
 - e. Special considerations
 - i. Concrete roofs
 - ii. Metal roofs
 - iii. Ventilating basements
 - iv. Ventilating high-rises
 - v. Ventilating windowless buildings
 - vi. Ventilating large buildings
9. Indicators of structural instability
 - a. Truss
 - b. Lightweight construction
 - c. Cracks or separations in walls, floors, ceilings and roof structures
 - d. Presence of tie rods and stars
 - e. Loose bricks, blocks, or stones falling from buildings
 - f. Deteriorated mortar joints
 - g. Walls that appear to be leaning
 - h. Structural members that appear to be distorted
10. Suppression approaches for various types of structural fires
 - a. Offensive
 - b. Exterior offensive attack
 - i. Blitz attack
 - ii. Transitional attack
 - iii. Softening the target
 - c. Defensive
 - d. Occupancy
 - i. Single-family dwellings
 - ii. Multi-family dwellings
 - iii. Commercial occupancies
 - iv. High-rises
11. Suppression practices for various types of structural fires
 - a. Residential fires
 - i. Attic

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- ii. Grade-level
 - iii. Upper-level
 - iv. Basement
 - v. Concealed spaces
 - b. Small business fires
 - i. Attic
 - ii. Grade-level
 - iii. Upper-level
 - iv. Basement
 - v. Concealed spaces
- 12. Association between specific tools and special forcible entry needs
 - a. Hand tools
 - i. Pry axe
 - ii. Detroit door opener
 - b. Power tools
 - i. Chain saw
 - ii. Circular saw
 - iii. Reciprocating saw
 - iv. Drill
 - c. Lock tools
 - i. A tool
 - ii. K tool
 - iii. J tool
 - iv. Shove knife
 - v. Duck bill lock breaker
 - vi. Locking pliers and chain
 - vii. Bam bam tool
 - viii. Elevator keys
 - d. Hydraulic/pneumatic tools
 - i. Rabbet tool
 - ii. Hydraulic spreaders
 - iii. Hydraulic rams
 - iv. Hydraulic cutters
 - v. Pneumatic spreaders
 - vi. Pneumatic cutters
 - vii. Pneumatic drills and saws
- OO. Control a flammable gas cylinder fire
 - 1. Characteristics of pressurized flammable gases
 - a. Pressure
 - b. Vapor pressure
 - c. Vapor density
 - d. Expansion ratio
 - 2. Elements of a gas cylinder

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- a. Cylinder design
- b. Cylinder valves
- c. Pressure relief valves
- d. Test limits
3. Effects of heat on closed cylinders
 - a. Increase in pressure
 - b. Thermal damage
 - c. Container failure
4. Effects of pressure on closed cylinders
 - a. Expansion of cylinder
 - b. Pressure relief valves
 - c. Container failure
5. Boiling liquid expanding vapor explosion (BLEVE) signs
 - a. Pinging sound of pressure-stretched metal
 - b. Discoloration of metal shell
 - c. Bulge or bubble in metal shell
 - d. Activation of pressure relief valve
 - e. Failure of pressure relief valve
 - f. Increase in intensity of pressure relief valve (torch)
6. BLEVE effects
 - a. Container failure
 - b. Violent explosion with fragmentation
 - c. Rapid expansion of gases
 - d. Huge fireball
 - e. Radiant heat
 - f. Flying container fragments
7. Methods for identifying contents
 - a. Placards
 - b. Labels
 - c. Shipping papers
 - d. Facility documents
8. How to identify safe havens before approaching flammable gas cylinder fires
 - a. Perform scene size-up
 - i. Note position and condition of container
 - ii. Analyze terrain
 - iii. Identify possible safe havens
 - b. Do not approach container from the ends
9. Water stream usage for pressurized cylinder fires
 - a. Volume of water
 - i. Vapor space
 - ii. Point of impingement
 - iii. 500 gpm minimum
 - b. Placement of streams

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- c. Manned vs. unmanned fire streams
- 10. Water stream demands for pressurized cylinder fires
 - a. Secured, uninterrupted source
 - b. Adequate stream application
- 11. What to do if the fire is prematurely extinguished
 - a. Vapor dispersion
 - b. Vapor control (close valve)
 - c. Secure or eliminate ignition sources
- 12. Valve types and their operation
 - a. Shut-off valves
 - b. Pressure relief valves
- 13. Alternative actions related to various hazards
 - a. Evacuate
 - b. Isolate
 - c. Allow self-extinguishment
 - d. Retreat
- 14. When to retreat
 - a. Failure of relief valve
 - b. Significant container damage
 - c. Loss of water
- PP. Protect evidence of fire cause and origin
 - 1. Methods to assess origin and cause
 - a. Legal considerations (Michigan v. Tyler court decision)
 - b. Unusual odors
 - c. Abnormal behavior of fire when water is applied
 - d. Obstacles hindering fire fighting
 - e. Incendiary devices
 - f. Trailer
 - g. Structural alterations
 - h. Fire patterns
 - i. Heat intensity
 - j. Availability of documents
 - k. Fire detection and protection systems
 - l. Intrusion alarms
 - m. Location of fire
 - n. Personal possessions
 - o. Household items
 - p. Equipment or inventory
 - q. Business records
 - r. Time of day
 - s. Weather conditions
 - t. Vehicles and people on scene
 - 2. Types of evidence

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- a. Physical evidence
- b. Trace or transfer evidence
- c. Demonstrative evidence
- d. Direct evidence
- e. Circumstantial evidence
3. Means to protect various types of evidence
 - a. Securing the fire scene
 - b. Chain of custody
 - c. Do not gather or handle evidence
 - d. Avoid trampling over evidence
 - e. Avoid excess use of water
 - f. Protect human footprints and tire marks
 - g. Protect partially burned papers found in a furnace, stove or fireplace
 - h. Leave charred documents found in containers
4. Role and relationship of Fire Fighter II to the fire investigation
 - a. The importance of writing a chronological account of important circumstances personally observed
 - b. Identify the importance of reporting hearsay to the investigator
 - c. Identify the importance of performing salvage and overhaul carefully
5. Criminal investigators
 - a. Fire marshal
 - b. Arson investigator
 - c. Fire investigator
 - d. Police
6. Insurance investigators in fire investigations
 - a. Insurance investigator
 - b. Private investigator
7. Effects and problems associated with removing property or evidence from the scene
 - a. Legal considerations (Michigan v. Tyler court decision)
 - b. Chain of custody
 - c. Documentation/photographs
- QQ. Rescue Operations
- RR. Extricate a victim entrapped in a motor vehicle as part of a team
 1. The fire department's role at a vehicle accident
 - a. Response
 - b. Arrival and size-up
 - c. Stabilization of the scene
 - d. Gaining access and disentangling victims
 - e. Removing and treating the victim
 2. Points of strength in auto body construction
 - a. Vehicle door and door posts
 - b. Vehicle roof

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- c. Steering wheel
- d. Vehicle floor
- e. Vehicle pedals
- f. Vehicle seats
- g. Reinforced dashboard
- 3. Points of weakness in auto body construction
 - a. Vehicle windshield and windows
 - b. Dashboard
- 4. Dangers associated with vehicle components and systems
 - a. Vehicle stabilization
 - b. Airbag systems (SRS and SIPS)
 - c. Roll over protection systems (ROPS)
 - d. Hybrid electrical systems
 - e. Fuels
- 5. Uses and limitations of hand extrication equipment
 - a. Hydraulic devices
 - i. Upright
 - ii. Upside down
 - iii. On its side
 - iv. On an inclined surface
 - b. Pneumatic devices
 - c. Block and tackle
 - d. Cribbing and shoring materials
 - e. Ratchet device
- 6. Uses and limitations of power extrication equipment
 - a. Hydraulic extrication spreaders
 - b. Hydraulic extrication shears
 - c. Hydraulic extrication ram
- 7. Safety procedures when using various types of extrication equipment
 - a. PPE
 - b. Flammable hazards
 - c. Electrical hazards
 - d. Pinch hazards
 - e. Crush hazards
 - f. Vehicle safety device deployment hazards
 - g. Proper tool use
- SS. Assist rescue operation teams
 - 1. The fire fighter's role at a technical rescue operation
 - a. Safety
 - b. Receive direction from technical rescue personnel
 - c. Work as a team
 - d. Basic components of rescue operations
 - i. Preparation

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- ii. Response
 - iii. Arrival and size-up
 - iv. Stabilization
 - v. Access
 - vi. Disentanglement
 - vii. Removal
 - viii. Transport
 - ix. Security of the scene and preparation for next call
 - x. Post incident analysis
2. The hazards associated with technical rescue operations
- a. Machinery
 - b. Confined space
 - c. Rope rescue (vertical rescue)
 - d. Trench
 - e. Structural collapse
 - f. Water and ice
 - g. Energized electrical line
 - h. Elevator and escalator emergencies
 - i. Wilderness
 - j. Mine, tunnel and cave
 - k. Industrial/hazardous materials
3. Types and uses of rescue tools
- a. Machinery (e.g., hydraulic spreaders/cutters/rams)
 - b. Confined space (e.g., taglines, harnesses, supplied air respirators, air monitoring devices, tripod, winch)
 - c. Rope rescue (vertical rescue, e.g., rope, carabiners, anchor plates, pulleys)
 - d. Trench (e.g., shoring, cribbing, stringers, rakers, air monitoring devices)
 - e. Structural collapse (e.g., jacks, shoring, cribbing)
 - f. Water and ice (e.g., PFDs, throw bag of rope)
 - g. Elevator and escalator emergencies (e.g., elevator keys)
 - h. Wilderness (e.g., compass, GPS, stokes basket)
 - i. Mine, tunnel and cave (e.g., shoring, ropes, flashlights)
4. Rescue practices and goals
- a. Machinery
 - b. Confined space
 - c. Rope rescue (vertical rescue)
 - d. Trench
 - e. Structural collapse
 - f. Water and ice
 - g. Elevator and escalator emergencies
 - h. Wilderness
 - i. Mine, tunnel and cave

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TT. Fire and Life Safety Initiatives, Preparedness, and Maintenance

UU. Perform a fire safety survey in an occupied structure

1. Organizational policy and procedures
 - a. Scheduling considerations
 - i. FD personnel
 - ii. Structure occupant
 - b. Approach and introduction
 - c. Conducting the survey
 - d. Formulate recommendations
2. Common causes of fire and their prevention
 - a. Housekeeping practices
 - b. Smoking
 - c. Open burning
 - d. Electrical sources of ignition
 - e. Common hazards by location
 - i. Kitchen
 - ii. Living area
 - iii. Bedroom
 - iv. Garage/storage
 - v. Bathroom
 - vi. Laundry
 - vii. Attics and basements
 - viii. Exterior
 - f. Special hazards
3. The importance of a fire safety survey and public fire education programs to fire department public relations and the community
 - a. Enhances community life safety
 - b. Prevents loss
 - c. Promotes community support
4. Referral procedures – AHJ

VV. Present fire safety information to station visitors or small groups

1. Educational programs
 - a. Learn Not to Burn
 - b. EDITH (Exit Drill In The Home)
 - c. Installation and maintenance of smoke alarms
 - d. Change your clock – change your battery
 - e. Stop, drop and roll
 - f. Fire safety for babysitters
 - g. Fire safety for seniors
 - h. Fire safety for college students
 - i. Wildland prevention program
2. How to use informational materials
 - a. Pamphlets

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- b. Coloring books
 - c. Public service announcements (PSAs)
 - d. Public presentations
 - 3. Basic presentation skills
 - a. Age and audience appropriateness
 - b. Knowledge of subject – preparation
 - c. Use of props
 - d. Professional attire
 - e. Positive attitude
 - 4. Departmental standard operating procedures (SOPs) for giving fire station tours – AHJ
- WW. Prepare a pre-incident survey
- 1. The sources of water for fire protection
 - a. Pressurized
 - b. Static
 - 2. The fundamentals of fire suppression and detection systems
 - a. Automatic sprinkler systems
 - i. Types
 - (a) Wet pipe
 - (b) Dry pipe
 - (c) Pre-action
 - (d) Deluge
 - (e) Residential
 - ii. Sprinkler heads
 - (a) Deflector style
 - (i) Upright
 - (ii) Pendant
 - (iii) Side wall
 - (iv) Deluge
 - (v) Special
 - (b) Activating devices
 - (i) Fusible link
 - (ii) Frangible bulb
 - (iii) Chemical pellet
 - iii. Control valves
 - (a) Outside screw and yoke (OS&Y)
 - (b) Butterfly valve
 - (c) Wall post indicator valve (WPIV)
 - (d) Post indicator valve (PIV)
 - (e) Post indicator valve assembly (PIVA)
 - iv. Valves
 - (a) Check valve

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- (b) Main drain
 - (c) Alarm test
 - (d) Inspector test
 - v. Fire department connection (FDC)
 - (a) Two 2½” inlets
 - (b) One large diameter hose (LDH)
- b. Standpipe systems
 - i. Class I
 - (a) Fire department use only
 - (b) 2½” connection with a valve
 - ii. Class II
 - (a) Occupant use
 - (b) 1½” single jacket hose preconnected
 - iii. Class III
 - (a) Occupant or fire department use
 - (b) 2½” connection with 1½” reducer and hose preconnected
- c. Specialized extinguishment systems
 - i. Dry chemical systems
 - ii. Wet chemical systems
 - iii. Foam systems
 - iv. Clean agent systems
 - v. Carbon dioxide systems
- d. Fire department notification systems
 - i. Local alarm systems
 - ii. Remote station systems
 - iii. Auxiliary systems
 - iv. Proprietary systems
 - v. Central station systems
- e. Fire alarm system components
 - i. Initiating devices
 - (a) Heat detectors
 - (i) Fixed-temperature detectors
 - (ii) Rate-of-rise detectors
 - (iii)Combination rate-of-rise fixed temperature detectors
 - (b) Smoke detectors
 - (i) Ionization
 - (ii) Photoelectric
 - (c) Flame detectors
 - (i) Ultraviolet (UV)
 - (ii) Infrared (IR)
 - (iii)Fire – gas detectors
 - (iv)Manual pull station

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- ii. Indicating devices
 - (a) Audible
 - (i) Bells
 - (ii) Horns
 - (iii) Sirens
 - (iv) Recorded announcement
 - (b) Visual
 - (i) Strobes
 - (ii) Rotating beacons
 - (iii) Fire alarm control panel (FACP)
- 3. Common symbols used in diagramming construction features, utilities, hazards, and fire protection systems
 - a. Construction features
 - i. Fire escape
 - ii. Skylight
 - iii. Stairs
 - iv. Elevator
 - v. Fire wall
 - b. Utilities
 - i. Gas
 - ii. Electric
 - iii. Water
 - c. Fire protection
 - i. Hydrant
 - ii. Sprinkler riser
 - iii. Fire department connection
 - iv. Automatic sprinklers
 - v. Not sprinklered
 - vi. Standpipe
 - vii. Fire alarm
 - viii. Fire pump
 - d. Hazards
 - i. Gasoline tank
 - ii. Steam boiler
 - (a) Vertical
 - (b) Horizontal
- 4. Departmental requirements for a pre-incident survey
 - a. Tactical information – considerations/planning for:
 - i. Water supply
 - ii. Utilities
 - iii. Search and rescue
 - iv. Forcible entry

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- v. Ladder placement
 - vi. Ventilation
 - b. Occupancy type
 - i. High rise
 - ii. Assembly
 - iii. Health care facilities
 - iv. Detention and correctional facilities
 - v. Residential occupancies
 - c. Locations requiring special considerations
 - i. Gas or liquid fuel pipelines
 - ii. Electrical transmission lines
 - iii. Ships and waterways
 - iv. Subways
 - v. Railroads
 - vi. Airports
 - vii. Industrial facilities
 - viii. Hazardous materials bulk storage locations
- 5. Departmental requirements for form completion – AHJ
- 6. The importance of accurate diagrams
 - a. Accurate diagrams promote better decision making
 - b. Enhances civilian and firefighter safety
 - c. Search and rescue operations are conducted efficiently
- XX. Maintain power plants, power tools, and lighting equipment
 - 1. Types of cleaning methods
 - a. Metal parts
 - b. Wood parts
 - c. Fiberglass/synthetic parts
 - d. Cutting edges
 - e. Power tools
 - f. Electrical/electronic devices
 - 2. Correct use of cleaning solvents
 - a. Associated hazards
 - b. Application
 - c. Safety considerations
 - 3. Manufacturer and departmental guidelines for maintaining equipment and its documentation
 - a. Per the manufacturer's recommendations
 - b. Inspection frequency and procedures per AHJ
 - 4. Problem-reporting practices
 - a. Tag problem item
 - b. Remove from service
 - c. Report problem per AHJ
- YY. Perform an annual service test on fire hose

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1. Procedures for safety conducting hose service testing
 - a. Routine inspection
 - i. Lay clean hose out on flat surface
 - ii. Inspect hose for defects
 - iii. Mark defects as found
 - iv. Tag hose with description of defects found
 - b. Annual service test
 - i. Don protective gear – wear helmet and gloves at a
 - ii. minimum
 - iii. Connect up to 300 feet maximum of hose to a discharge outlet
 - iv. Attach a nozzle or valve to the end of the hose
 - v. Fill hose to 50 psi, remove air, twists and kinks in hose
 - vi. Mark hose at the base of the coupling
 - vii. Check couplings and hose for leaks
 - viii. If couplings leak at the gasket, replace the gasket
 - ix. After gaskets are replaced or if no leaks are present, increase pressure to manufacturer's recommended pressure per NFPA 1962 and maintain for 5 minutes
 - x. Monitor hose and couplings for leaks or failure
 - xi. Reduce pressure, depressurize hose, and drain
 - xii. Inspect marks at couplings for separation or slippage
 - xiii. Tag failures or defects
 - xiv. Distinctly mark hose that passed
 - xv. Log test results for departmental record
 - c. Safety notes:
 - i. Always wear a helmet and gloves while working around pressurized hose
 - ii. Never walk over, straddle, or stand over hose being pressure tested
2. Indicators that dictate any hose be removed from service
 - a. Mechanical damage
 - i. Bent or damaged couplings
 - ii. Hose separating from couplings
 - iii. Cuts or holes
 - iv. Crushed suction hose
 - b. Chemical damage
 - i. Chemical degradation
 - ii. Contamination
 - c. Heat damage
 - i. Burn holes
 - ii. Delamination
 - d. Mildew/rot
 - e. Service test pressure failure (i.e. burst hose)
3. Recording procedures for hose test results
 - a. Hose records should contain:

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- i. Hose size/length, type, and diameter
- ii. Date of manufacture
- iii. Date of purchase
- iv. Testing dates
- v. Any repairs made
- b. Other information per AHJ

Grade Scale

90 – 100	A
80 – 89	B
70 – 79	C
60 – 69	D
0 – 59	F

Course Evaluation

Live Fire Evaluations	5%
Exams	60%
Research Paper	10%
Physical Training	5%
Final Exam	<u>20%</u>
Final Course Grade	100%

Course Policies

1. No food, drinks, or use of tobacco products in class.
2. Computers, telephones, headphones, and any other electronic devices must be turned off while in class or used only with permission of the instructor.
3. Do not bring children to class.
4. If you wish to drop a course, the student is responsible for initiating and completing the drop process. If you stop coming to class and fail to drop the course, you will earn an 'F' in the course.
5. Additional class policies as defined by the individual course instructor.

Technical Requirements (for courses using Blackboard)

The latest technical requirements, including hardware, compatible browsers, operating systems, software, Java, etc. can be found online at:
[https://help.blackboard.com/en-us/Learn/9.1 2014_04/Student/015 Browser Support/015 Browser Support Policy](https://help.blackboard.com/en-us/Learn/9.1/2014_04/Student/015_Browser_Support/015_Browser_Support_Policy) A functional broadband internet connection, such as DSL, cable, or WiFi is necessary to maximize the use of the online technology and resources.

Disabilities Statement

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The Americans with Disabilities Act of 1992 and Section 504 of the Rehabilitation Act of 1973 are federal anti-discrimination statutes that provide comprehensive civil rights for persons with disabilities. Among other things, these statutes require that all students with documented disabilities be guaranteed a learning environment that provides for reasonable accommodations for their disabilities. If you believe you have a disability requiring an accommodation, please contact the Special Populations Coordinator at (409) 880-1737 or visit the office in Student Services, Cecil Beeson Building. You may also visit the online resource at <http://www.lit.edu/depts/stuserv/special/defaults.aspx>

Student Code of Conduct Statement

It is the responsibility of all registered Lamar Institute of Technology students to access, read, understand and abide by all published policies, regulations, and procedures listed in the *LIT Catalog and Student Handbook*. The *LIT Catalog and Student Handbook* may be accessed at www.lit.edu or obtained in print upon request at the Student Services Office. Please note that the online version of the *LIT Catalog and Student Handbook* supersedes all other versions of the same document

Starfish

LIT utilizes an early alert system called Starfish. Throughout the semester, you may receive emails from Starfish regarding your course grades, attendance, or academic performance. Faculty members record student attendance, raise flags and kudos to express concern or give praise, and you can make an appointment with faculty and staff all through the Starfish home page. You can also login to Blackboard or MyLIT and click on the Starfish link to view academic alerts and detailed information. It is the responsibility of the student to pay attention to these emails and information in Starfish and consider taking the recommended actions. Starfish is used to help you be a successful student at LIT.

